Building Accessibility into Social Virtual Reality Experiences
Accessibility VR Meetup - March 15, 2024

(AI transcription, slightly corrected)

Thomas Logan
Well, thank you everyone, for being here today, I have quite a lot of slides. And I'm gonna keep it to the time because I really want to have a great conversation in here. with you all, I'm very excited to be in the studio platform. Today, it is very important to me that we started the presentation today with the accessibility features of at Studio. I have been working in building accessibility into social VR experiences for many years. And I really love that studio has this accessibility settings. So front and center inside the application itself, and I can't say enough positive things about it studio actually built thing accessibility into the social VR experience.

My whole career, I guess, in the VR space has been like, let's make sure these features are available in a social VR experience, you know, the same way that we expect a Zoom meeting to be accessible, I want everything that's happening inside of VR to be accessible as well. And so what today's presentation is really to talk about some of the lessons learned from doing a meet up in VR. And also, sort of where do we go forward from here. And I definitely feel like this environment and getting to have all of you all here with me in the Edstutia theater today. I think we're already moving forward in an accessible space for making accessible experiences in social VR.

So, I run a meetup called Accessibility Virtual Reality. It's meetup.com/a11yVR. That is where we have typically a monthly meetup. But honestly, we've been, we've been remiss for probably six months, eight months, we've been on a hiatus, and now we're really coming back. I'm very happy to be coming back in this space, where we have accessibility features. One of the goals of my meetup was always to use the latest technology and try to encourage feedback, you know, from the users, actually, like, let's come on to a meeting, let's learn from what is accessible and what's not accessible.

So, I want to put that out there to our group, who is here with us today. We, we know that we're not like 100% accessible, but we're trying to learn through doing and we want to encourage you to give us feedback. If you have recommendations on how we can improve the meeting experience, we want to hear from you and get that information.

I also just want to plug, here's me in a different outfit. I changed my outfit today to be a little more dolled up for the presentation. But here's Amanda, and I took Edstutia's course, the ICXR for learning how to make more engaging presentations in VR. And I really appreciated that course, as well. My team ended up winning our specific group. And we were really interested in like, how can we make presentations more engaging? I really loved the course, because one of the big takeaways as someone who has hosted a lot of meetings in VR, like how can we make more engaging presentations in VR, we don't want it to be the same as zoom. So hopefully, I'll be able to demonstrate a little of that today.

My company is called Equal Entry. So again, my name is Thomas Logan and the owner of a consulting company called Equal Entry. We on our website, we actually have a specific area for AR VR XR. So, anything that I talked about today, it's all actually referenced in more detail on our website. And so if there's any topic that I kind of glanced over today, you can get much more details by going to the equalentry.com website and selecting from our blog, the AR VR XR section and we have a lot more details on everything I'll be talking about today.

Three things that I think are really interesting for accessibility. I'm going to show this slide and I'm going to play a video for you. But the first three that were really interesting about making an inclusive space and social XR, I think number one is just the avatar creation itself. This was like you know, just so important with a lot of people want to actually represent how they are perceived in the real world. in a virtual world, and so having an avatar who can be in a wheelchair, or an avatar, who can have a hearing aid, an avatar, who can have a white cane, any of these, you know, things in the real world that people with disabilities would be using should be available in the virtual world. And that's just like a one big picture item to discuss is that a lot of social platforms don't

allow that type of customization, they, they don't think about inclusion from the idea of someone having a prosthetic arm, someone using a guide dog. But really, if you're thinking about full inclusion, and how people show up in the real world, these are all things that should be available from avatar creation. So that's, that's number one.

And number two, and we're actually demonstrating it here today, real time transcription services. So having captioning having the ability to communicate, what's being spoken via audio into a display of captions is very important for inclusion in, you know, social connection. If someone can't hear what you're saying, the ability to have a text translation of what you're saying, available and visible is huge. And so I thank you really again, Edstutia, for having this feature built in. This is an area where many platforms that have come before its video did not have this feature, and really made it very difficult. For me as an organizer of trying to do an accessible meetup. I need that feature to have an accessible meetup. So I think this is like, really fundamental to social VR accessibility is to have captioning available.

And then the last one would be voice commands for navigation. I'll be probably geeking out a lot in this presentation today. But in a lot of areas, voice control is a great way to get around some of the barriers of being able to use two hands and or like fully control these devices that we work with. So most of us here today are probably using a quest two or quest three, you know, with the hand controllers themselves, there's many different buttons, there's the thumbstick, there's two different buttons that are raised, and there's a recessed button on the right hand and left hand. All of that is complicated and sort of new design patterns and voice commands actually give people more of a semantic way to use virtual reality. And so I think that's another big, big, big picture requirement is to think about how can you enable voice commands in your experiences so that people don't have to necessarily know how to use the hand controllers as elegantly and will show examples.

Okay, I'm gonna play you all a short video. And I just want to also just show off this cool feature, and it's video. So I'm gonna play a short. It's about a two minute video, but this is a video my company made about six things that are pretty important for VR accessibility. Let's start that now.

[VIDEO PLAYS]
Hey, I'm James Herndon at Equal Entry. According to a PWC report, virtual reality is the largest segment in entertainment and media based on projected global growth. As more companies invest in VR, it's important to keep accessibility in mind from the start. Here's six tips to ensure your VR app is accessible.

First tip is to ensure all text shown on the screen is said out loud. This includes menu options and settings.

The second tip is to add speech to text capabilities. Typing and virtual reality can be tedious, allowing people to voice what they want to say and convert it into text will be faster.

Tip number three is to allow users to customize their text, font size and color preferences. Offering light and dark mode is a good place to start. Ensure both modes are tested for sufficient color contrast.

Tip number four is to have captions for all spoken dialogue, music and sounds. Make sure the user knows who is speaking for music describe the mood of the music. If there are song lyrics, those need to appear in captions, and describe any sounds including longer periods of silence.

Tip number five is to always give people at least two ways to communicate. Not everyone wants to speak and not everyone can hear what other people are saying.

Tip number six is to give people at least two ways to interact with your app. Not everyone can use the controllers.

Some apps make it possible to use your hands to interact with the environment by applying these six Tips, you can significantly expand the audience for your app, thanks for doing your part to create accessible virtual reality experiences.

Thomas Logan
Alright, that's just six items. But you know, there's more than six people that work in accessibility. Now, there's a lot of things to consider. But we kind of put that item together to highlight some of the items we've come across.

And I want to go now to, like, really, one of my main areas that I have a concern about is this idea of 3d objects that get created in a virtual space. And so a lot of times, and we'll do an interactive demo here. But in in the oldest requirements for accessibility, one of the first was this idea of an image, if you use an image on your website, it should have all tests. If someone's blind, and they can't see the image on your website, how do you describe that information to someone who can't see the image? So what is VR have right to enable that, and I think one of my big positions as someone that cares about accessibility and new technologies is, we should at least have the minimum requirements of what we've already had in the past.

So, in the web, we have a way to label a object, we can say this image has an alt text of this, we really don't have that in spatial media. So like, the different objects that we used to load in 3d objects do not have a way to add alternative text for someone who's blind. So what we ended up working on, a lot of the work that we did with my company was with Mozilla hubs, which, rest in peace, Mozilla hubs is unfortunately now no longer an active social VR platform, but one of the first things was they had this ability to list objects in the room. And on the screen, I'm showing that the way those objects were named would be like reticulum underscore 4, C 4, 3, and risk reticulum dot i o underscore 3007. Really not easy to understand. What does that mean, right? Like, the typical joke on the web, is if you just hear the file name, as a description of the image, you have no idea what it is. So we need to have a way to label things that are used, like label the objects that exist in our world.

So, like, in this space that we're currently happening, we have different seats, right. And we have stage and we have, you know, an amphitheater as a whole world. We have an Edstutia logo, if you look behind you. On the back left, you have Edstutia logo placed inside of the space. So how do we make that available and inclusive for people that might be coming into this space, blind or low vision and they can't necessarily read that? That's one of the, like, core challenges that my company tries to work with and create solutions for.

So, I worked with Owen Wang, a software engineer from New Zealand, actually, so he was the intern for me, and we came up with a user interface in Mozilla Hubs to label objects. So, for example, I know the pixelation here a little bit difficult to read. But we were labeling an object in the world that was like a black Les Paul guitar with two P90 pickup ups and nickel plated hardwood hardware. So we were able to provide a label for the object and then save that into the environment so that someone who's blind could get that information from the object.

 And here's a very simple example.. I'll be using a lot of Japanese examples in today's presentation because I lived in Tokyo for four years. So here's this very cute shiba inu puppy object that we can download from a site such as Sketchfab. And maybe in our instructional design, we want to use the shiba inu, for any reason, well, how do we get the information about the shiba inu, available to people who are blind or low vision. And so, by default, we're showing over here this user interface we had in Mozilla hubs where we could give it a name, and then a type and a description. So the name could be like shibu type with 3d model. And the description was not set. Yeah. But we were really going from this idea of same way we have on the web, you have the idea of a short name and then a long name. And so what we were trying to enable was, as developers or authors have experiences, to be able to set different values for this information, so in this instance, someone

could set name equal shibu, description equal tan colored fluffy. Someone else though, could be like, name is dog and description, shiba inu wearing red collar.

This is one of the like canonical challenges of providing this feature is that there's not really a single answer to what how an object should be described. But we need to think about why it's being used in a specific experience, and then give it a good label full. So this this idea is that we allow the author of the virtual reality environment to set the name and description and it's not always going to be the same. Again, another example would be name equal dog, white and tan, shiba inu puppy wearing red collar and seated position. Again, it really depends on how you're using the image in your work, what should be described.

And I don't think AI is good at doing this, by the way. So, you know, there's a lot of new ideas of using AI to describe images. But a lot of times, I think AI has no understanding of how objects are being used, and specific experiences and the idea of alt text and the accessibility requirements for describing things appropriately. For people who are blind and low vision, it really always depends on the context for the experience.

Next, I just want to show you that my company built this virtual conference area. And basically, we built this model, and we ran a user study in New York City, with people who are blind and low vision to figure out how could you navigate a virtual environment, and then get information from objects in the virtual environment. So we built this like, conference room. And then we basically made a convenience store Japanese convenience store, where we had different groups, different objects that came from a Japanese convenience store. So we had wasabi, spicy nuts, we had this Calbee, which is more like a french fry, like salty food. And then Pocky, which is probably very familiar to some of us in the audience, but Pocky is more of a like chocolates sweet that people would be able to access. And how would you know, in virtual reality, if you're a person who's blind, to pick which objects he wanted to pick up?

You know, it's the same way like how would you know, in the real world, if you go to a grocery store, how's it laid out in the world, and so we worked on a method of providing descriptions, such as the Pocky, the name of the product is Pocky. And then the description was chocolate coated cookie sticks, it was named after the Japanese onomatopoeic word pokkiri, which is supposed to resemble the sound of the snack being cracked. Then we had the price $2.19. And we had the size, 8 times 3 times 15 centimeters and the weight 40 grams. So we were trying to explore the idea in virtual reality that you can model the real world in virtual reality, and how much information can you provide to someone who's trying to explore. You know, in the virtual environment, we have all this data, so how would we make that available as a quick Interactive?

I'm going to try to spawn these objects and then I just want to have a little bit of an interactive, let's see if I can do this. I'm going to put over here. Oops, I'm putting this, this is the spicy sort of french fry. Sorry, not spicy, but it's more of a salty french fry snack and then I'm going to put a sweet hockey stick there in the middle and try to position that and then let me spawn one more object...

and this won't be a little bit more of them. But it's like basically a peanut and rice snack where it's got wasabi and it's spicy. So just to have a quick interactivity here with the audience. If you'd like a salty french fries snack, please move over to the salty snack, if you like a sweet chocolate snack, please move to the Pocky, and if you like a spicy like peanut and rice snack, please move to spicy, and we just want to do a quick interactive here of like, what's your favorite snack junk food? I guess lot of people going to the Pocky.

Oh my gosh, Pocky, Pocky stock is going up.

Anyone picking anything other than Pocky? Well, I would pick Pocky too, actually.

Well, oh, Anima wants the spicy wasabi. I like that. Yeah, it's a nice product. That's actually the one that I ate the most, I think, living in Japan, was the spicy one. But if I pick only one, I'm going to go the sweet.

And Amanda and Peter are here with the salty french fries?

Amanda
Yes, for salty french fries in any culture.

Thomas Logan
Well, thank you guys. Yeah. So I wanted just to like show off this idea, right, that this is something I've learned in the ICXR course is how can we make a presentation more engaging? And, you know, I'm still learning, too. But I like being able to have this type of question to the audience. It just lets us be more engaged. And it's different than being in a Zoom. Right? Where we're just listening to someone present, on and on. And so one of the ideas to hear that was like, how would we make that accessible to someone who's blind, right, like, so if we wanted to run this exercise and be inclusive? People are going to need to know which one is which, right? And like, how would you navigate to the right one, if you can't see the objects visually? On the screen? I mean, delete these objects. My question I built this world, with, actually, I didn't build it. But I did a test in a world of like going to a educational class. And I think a lot of us here are educators.

So, the idea is like you're going to your first day of school and you're in virtual reality. Your first day, what are you going to wear. So number one, again, going back to this idea of the Avatar, today, I put on this like, white hat, and I put on a tie for you all in some jeans. So I was trying to communicate, I guess, some type of relaxed style, but also a little dressed up, I shouldn't have that information available. Right? To someone who's blind like the same way that you can visually see how each of us are dressed. You're in the room. That's a visual information like Amanda's in all black looking very sleek, right, and Anima has blue hair, and you know, like Sabra's wearing a pink tarp? That information is all I think part of how we want to present ourselves in the VR world. And so how do we make that information available to people who can't necessarily see it? So that's this question.

And another one is, you know, you're going to a class and maybe your first class is that English class? How do you know how to get to that space. And so a lot of these virtual environments, including where we are today at Studio, we're here in the amphitheater, but you might have, you know, many different places to go. So we played around with the school layout in Mozilla Hubs and we labeled different rooms we actually have like, on the screen showing there's a layout of there's a one classroom to classroom three classroom, and then it seems like for is like these different breakout rooms. And so the idea would be like, you could label these worlds with like labels such as English room with four tables. So in this particular space, there was four tables you could sit at. And then each table has eight seats. So again, getting into the digital, what is cool is like you could be like against the seat occupied if someone's sitting in the seat, is the seat open to sit that so like, again, I think this is really cool, like this blending of architecture and tech to be like we can describe all of this for people that might not necessarily be able to see it. We can label these objects and make that inclusive and this was showing and this was actually Spoke on Mozilla how to edit virtual. But this is like you could actually like this is what kind of makes me mad in accessibility is like, well, we have this whole structure when you're building the environment as a creator, you're basically setting up tables and you're setting up groups of chairs.

So, just we need to pass through the information so that people who are blind can get that information. This was really showing thing that like, as you got into a room, there were every single seat, there's a viewpoint and this is like how you would position on the views, much like in the amphitheater, all of us are going to be like viewing the stage in the seats. But like, you know, each seat has its own accessibility settings. Then I was saying, like, you know, it's kind of cute. It's more of a like, kindergarten, a five, maybe primary education, but there's like posters on the wall. If you purposely put a poster on the wall that said, reading as a passport to countless adventures. Mary Pope can't read the last name, accessible to me. But like this idea of this object being in the room, I want all of that to be described and available to the learner.

And then here was a how to write English characters in uppercase and lowercase that was also in the room. And these are all things that can be put into virtual reality, but how do we express them to people?

Another feature, just just really throwing you guys a lot of ideas. But there is a way to put a filter in Mozilla Hubs so that you could simulate being low vision. And one of the discussion points here is that we don't want to simulate disability and pretend that we understand a person with disabilities experience. This is like a common critique of this type of design. But one thing that is cool is that you can try to use the same world with this very dark, obscured filter and be like, Well, what is the experience like? And so I'm more open minded in the idea that like, I don't think we should say that this is a substitute of like working with a person with a disability to understand the challenges. But I also think it can help designers and developers understand, oh, this is why I need to have stronger contrast or stronger colors. In my environment, like you turn on this avatar and you start seeing the world through a much more like dim view, or you simulate just the idea that this is how other people experience your world. Don't think about your world only as like how you see it. So I think it's an open area, I just say it's kind of a bit of a hot button issue in the accessibility world.

I do want to say too, we have tons of presentations on our accessibility topics. So if you've liked what I've presented so far, all of our recordings from the A11yVR meetup has been posted to YouTube with accessible captions. So we have a lot of different presentations on, you know, a ton of different ideas in the space. This was us in the very first version of our meetup. We were living in like a very open space. It's very, like minimal. And we were trying to figure out how do we get a presenter, captions and slides to display in virtual reality. And so this is kind of how we started, like we had blue background and yellow text. And then we would put our slides above it. And we'd have our presenter in the top right. And we basically this is me, and like, my avatar here was like camouflaged robot avatar. But one of the problems that started happening in this space, and this is just only learned from like living the experience, the avatars will be like blocking the captions.

So this is different than the implementation we seen. In that studio, you have a caption display box. But in hubs, we had to actually display the captions in a specific area. And what ended up happening was like people would stand in front of it. You know, occasionally, those people were like blinds and so they had no idea that they were even standing in front of the captions, but they were making like a bad VR experience for people because people were trying to read the captions. So we learned a lot from just doing, as I mentioned. And so what we ended up doing was starting to use more of an amphitheater like we are in now. So we changed our meetup up. It went from this open space to being like, no, let's put it in a presentation environment. And we tried to design the world to make it more visible.

Another thing we thought about, which is again, it's fascinating to me, I've worked in digital accessibility before 20 years, I think physical accessibility, such as like wheelchair ramps, accessible bathrooms, these ideas aren't something I had to think about in tech. But when you go into VR, you start being like, No, you do need to think about the design of your architecture. And so one of the things we did when we were building our world in Mozilla Hubs, we're trying to figure out like, how do we make it so that people can navigate up and down different areas, so much like the room we're in here, we were trying to make it that if you're doing fluid motion, and trying to move up and down through spaces we were working on, don't have, you know, like the same way in the real world, you couldn't have a ramp that then goes into a barrier, you have to redesign the space and think about, how do you make it easy to navigate?

And I think it's very cool that in digital, we can make an inclusive environment based off of the actual architectural design of the space. So what we ended up doing was making this sloped access. So basically, to navigate up to get into the front, here, here's in the viewing space, we made a ramp on both sides that can be navigated up. And then you move up to different levels via using this like double sided ramp. And so again, I worked with like a pretty cool architect to think of this and design this. But it's like an interesting place. And almost the time we've got here, Pablo is actually the person that helped me design this. So he's presenting at our meetup. And one of the things too, that we did at our meetup was to move the presenter to be more on the top right of the slide might be interesting to get your feedback for this world, we kind of came up with it was better for the presenter to be the top right of the slides. And that's what we tried to do.

And then we also implemented a feature where you could see your speaker notes in the bar. So when you're up there presenting to the audience, you still have the same idea that you have in the real world where, you know, we want to have our speaker notes displayed and visible. And so that was I thought a pretty cool feature in Mozilla Hubs that you could be presenting slides and also see your speaker notes while you're presenting.

And then lastly, like this piece here, like one of the things in Mozilla Hubs was having the chat feature. And so if you think back to the video, we started with the beginning, it's kind of important to have the ability to have a secondary function to communicate. So if you can't communicate with your voice, you still want to communicate with the people in the room. Mozilla hubs did have that where you can have a chat feature. And you could be having text based chat with anyone. So, if you're a non speaking person, or you're someone that just prefers to communicate via written text, you had a way to still participate in the conversation via chat.

And then lastly, I just want to end with the format that is really important for making it accessible is I think GLTF. GLTF is the JPEG of 3d, in quotes. But this idea that like odd objects that get created and spawned in virtual reality, it's really like how do we add into GLTF the ability to label an object. And so this is just to show you that on the web, you can load a GLB or GLTF format and use alt text to give it a label. But we can't actually do that inside of a VR experience like we are today.

I also just want to say again, plug for my website equalentry.com. We've done a lot of work. We worked with three different developers from India to do implementations for Unity. We did how to implement multiple locomotion, locomotion styles, how to add captions, and how to add and display settings for color. We basically built like a how to tutorial in Unity for techie people to actually make their VR experiences more accessible.

In closing I think VR accessibility is crucial. So I think all of you all for being here today, let's prioritize accessibility features in VR platforms. With our meetup, we want to celebrate people really doing that. We do celebrate Edstutia for having accessibility features built into their platform. And, like, let's also encourage ongoing research. So if you're someone also working in this space, and you have a passion on making VR more accessible to people with disabilities, please reach out to me, I would love to connect with you. And you can find me on LinkedIn or Twitter as TechThomas. Thank you.

Amanda
I think Karen has a question. Yeah, go ahead.

Karen
So I'm struggling to think how someone who is blind would be able to participate in VR with it, they'd have to have the headset on. Right. Right. But and obviously, that I just I'm I understand what you're, you know, some of the things that you were saying, but it's just it's still it's very difficult for me to kind of relate to how they would actually experience it.

Thomas Logan
Yes, I actually cut out a few slides. So apologies for that. But I think one of the ideas. If you're familiar with Second Life, which was really like, one of the primary VR experiences, I really took a lot of lessons learned from some research in Second Life as far as how to navigate between spaces, like I think one of the most important barriers to overcome is just how do you navigate to, for example, the amphitheater or the, you know, I think here in our world, like we have seen, we have like, a few places, right, that we can go to and navigate to the names of those worlds. As far as like, if you just even want to participate in the conversation, first, you need to get the space. So

that's like, maybe one of the starting points, that I didn't explain it that great with the school example.

But I was really like, you need to know, like, if I'm supposed to be in the like, English class, how to someone, right? Like, even if it wasn't that you needed to get all these descriptions, you still need to get to the English class to have the conversation. So that's one starting point. And then I think a lot of it is still in the research area of like how people are using VR to teach and communicate. But again, I go back to if the object has no label, it's, it's not usable. So I really am starting from this place of let's give labels to every object allow people to move to those objects, like, ask questions about those objects. We have to start there. And then I think there's obviously more to come. But I really do start from the like basics of well, you need to have some description of the environment.

Amanda
I see Peter's hand up and then Steve, you'll be next.

Peter
Hi, Thomas. Thank you. Amanda. Can you guys hear me? Yes. Okay, a lot of the same questions. Yeah. I really love the idea. And I, like you, Thomas have been working a lot in Second Life. And now in opens. In fact, what we have tried to do in our environment is to add audio descriptions, to speakers within our open scenario. And I've always been a big advocate about we need to have this way of labeling like an old tax in a 3d VR space. So I'm glad we're on the same track on this. But so the question I have then is I see that you have done that in most of the hubs in one of the challenges we had in open sim or similarly in in Second Life is the, the viewer itself is not screen readable. So even though you might have this, this labeling and all that it's not read out. And so how is it implemented in Mozilla Hubs? Unfortunately, I'm sad to hear that is also closing now.

Thomas Logan
Yes, so I mean, good question. This is one of the reasons why my meetup liked doing Mozilla hubs was that we could kind of hack the web to make it accessible because the web and HTML has much more of a like framework to work with assistive technology. So we were able to use things like ARIA dash label, and role attributes on 3d objects in the DOM to make them accessible just without having to build the screen reader.

Do you think if you're building something directly in Unity or Unreal, at this point, you have to sort of build the screen reader, or you have to build the assistive technology while you're building your experience. So it's difficult. And that's why we liked the web one was like, we could kind of do it. But it still wasn't. Right, like as elegant as it should be. But that's what I was trying to push for word

was a, if you're creating Jaws, screen reader, or NVDA, screen reader, or VoiceOver on the Mac, can we work with you to make it that when there's a glTF object, it sets an alt text, right. And then I think, just getting the building blocks, there is very important to build on top of this.

And I think a lot of people have the argument of like, we can't do anything because it's new. I'm more like, let's just do the same thing we had before at least start from there. And then let's innovate on top of that. So that's my position is coming more from at least have the equivalent of alt text for these objects. And then let's do something more beyond that. Once we have that, we don't even have that.

Steve
Thank you for your good work. Really quickly. So now that Mozilla Hubs is ending, were you guys planning to move to that? Well, I love Edstutia, what do you think? I'm like, Edstutia, and I actually like, again, I can't say enough that I do really admire that, instead of just saying they're going to work on accessibility, they did work on accessibility. And when you go into accessibility settings, there's four settings that you can turn on. And I really think that, at least in my ethos is like, okay, like let's keep helping support Edstutia to make the most successful platform, I always want to support people that are actually doing the work. So that's why I'm happy to be here.

Amanda
So the first question is from David, one of the accessibility challenges often found in traditional 2d video conferencing platforms is the use of the chat feature, and their interaction with screen reading software for people with a vision impairment. This often results in screen reading software, reading out every chat entry, which competes with the actual presenter. How can we manage this in VR environments?

Thomas Logan
Yes, I think that's a great question/observation. I think this is really more the innovation that needs to happen on the assistive technology side, because right now, it's more like, I want to hear description, or I don't want to hear description, it's very like binary, turn it on and off. But if you think about the advances that we can be doing with AI, as well, I think we want to have it more smarter, where it's like, summarize, and or, like, give me that notification, but don't interrupt the entire presentation speech. And so I think that's sort of the same way that visually, if you're attending my presentation, and then you got a text message, you may or may not respond to that. It's like that kind of design needs to be thought about more diligently where it's not like, oh, every notification gets spoken, there should be something more smart. Like, I only want a notification. And for the fifth one, you know, again, it's difficult. I'm like, I'm not the expert in that. But I think

there's a lot more innovation opportunities there. And not just like brute force rebuilt, whatever gets put in the chat.

Amanda

We should improve. Yeah. Yeah, that's a great point. And I'll just add, this is just one solution. And I don't know that it's the ultimate solution. We're still testing it out and seeing if it works for people as well. But that's one of the reasons why, when we were talking about the spoken notifications, and in Edstutia, you have the ability to enable it, but you have to actually point and click to get it to read it out. That's an individual choice we made. It might not be right for every platform. But we really thought about in Edstutia, the majority of the users are using this for soft skills for conversations and interactions and the spoken notification, the notifications themselves are usually not critical to your understanding of what's going on and might be more disruptive if they were always read out than if you just have the option. So there are some downsides to that if you have a mobility impairment or low vision, it might actually be hard for you to click on that to point your trigger and click there. So that might not work best for you. But for our particular application. That seems like the best choice the majority of the time, and we'll see what the user feedback is and then we might end up tweaking it for another application where the modifications were really critical to understand what was going on. It might have been a different choice.

Thomas Logan

And I just want to say like, I think that's so great. So like, really make sure you try the feature out and give your feedback because I do think I'm also really open minded to that. It makes sense why you made that decision. And let's get feedback.

Amanda

All right, and the last question, I think it's around a very similar topic. I'm going to try and reach out quickly because I know we only have one minute left, but from Toby, on Google Meet, thank you for your talk. As an occupational therapist, who is a gamer and VR enthusiast, I would love to get involved in this project and making VR more accessible. For low vision. Do you think it would be beneficial for having audio reading or descriptions combined with haptics? Obviously, audio readings we have talked about already, but haptics hadn't come up yet. What are your thoughts there? Thomas?

Thomas Logan

Yes, definitely using haptics and I think one thing I didn't plug in today's presentation, which I should have, I am pretty happy with meta having -- there are nine accessibility checks, the meta publish, they're not requirements for people building software for meta, but they're like

recommendations. But that's actually one of the recommendations is if you do any type of information, try to make it visual, auditory and haptic. So I think that's a great best practice to live by in VR is that if you can always communicate through all three channels, because depending on a person's ability, maybe two channels are available, one channels available, but the more that you, you know, create information that's available through all channels, the more that it's inclusive, so yeah, I would just say, Yeah, let's evaluate that too. But the more channels you put information through the more accessible it will be.